Incorporating Climate Change into Management of California's Water Resources

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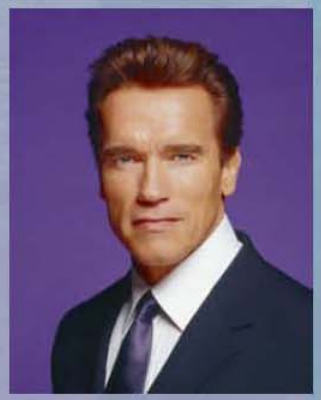
Incorporating Climate Change into Management of CA's Water Resources

- Governor's Executive Order
- CC and California Water Resources
- DWR/USBR Ad Hoc Team on CC Assessment
- Uncertainties and Risks

Climate Change

"I say the debate is over. We know the science. We see the threat. And we know the time for action is now."

-- Governor Schwarzenegger
June 1, 2005
World Environment Day



Executive Order

- Establishes emissions targets
- CalEPA to lead a coordinated effort
- Scenario analysis to assess impacts on several areas including water
- Builds on existing efforts, eg. CEC
- Climate Action Team was formed to coordinate impacts analysis and reports to the Governor and Legislature

Additional Motivation

- CA Executive Order
  - EO S-3-05 June 1, 2005
    - Biannual Reports; formal “Climate Action Team”
- CA Legislation
  - CA State Water Plan Updates
- Federal Legislation
  - 1990 Global Change Research Act
    - Federal agencies to periodically assess potential impacts
- Recent Trends
  - Increases in Global CO2 and Earth Surface Temp
  - Earlier Snowmelt in Northern CA (Roos 2003)

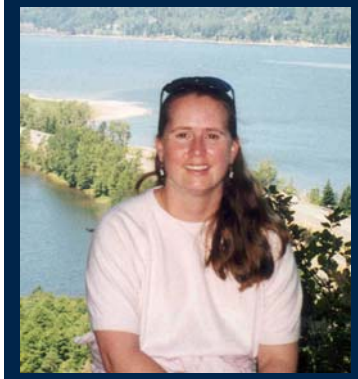
What fundamental changes are we talking about for California?

- √ Increased temperatures
- √ Changes in Precipitation/Runoff
- √ Sea level rise

Potential Impacts?

- Water Supplies
- Water Demands
- Water Quality
  - Tributary Temps
  - Delta
- System Ops
- Sea Level Rise
- Etc.

Climate Change Work Team



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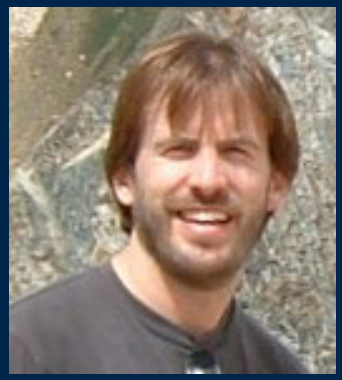

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Work Team Objectives

- Develop and Implement Work Plan
- Build coalitions with Climate Research Groups
- Move discussion from impacts to risk
- Periodically update information and methods

Coalition Building

- Collaborating research groups:

SCRIPPS Institute of Oceanography

U.S. Geological Survey

Lawrence Livermore Lab

Santa Clara University

Lawrence Berkeley Lab

UC Davis

California Energy Commission

UC Berkeley

Work Plan Progress

- Agency tools have been used to assess impacts
  - Report to CA Governor's Office (Jan 06)
    - 4 Scenarios (2 climate models x 2 emissions scenarios)
  - Climate Researchers providing data on:
    - runoff changes
    - local weather changes
  - Work Team producing impacts data on:
    - Water Operations (CALSIM II)
    - Delta Water Levels & Quality (DSM2)
    - Aquatic Temperatures (Sac Valley Temperature Models)
    - Power Operations (CVP LT-Gen & SWP Power Module)
    - Evapotranspiration Demand (SIMETAW)

Analysis Process

Global Modeling	Regional Downscaling	SWP & CVP Operations	Delta Flow & Water Quality
			
GFDL or PCM	VIC	CALSIM	DSM2
Air Temperature Precipitation Humidity Radiation	Streamflow Snowpack Snow melt Soil Moisture	Reservoir Ops Deliveries Storage Delta Outflow	Flow Salinity Sea Level Rise

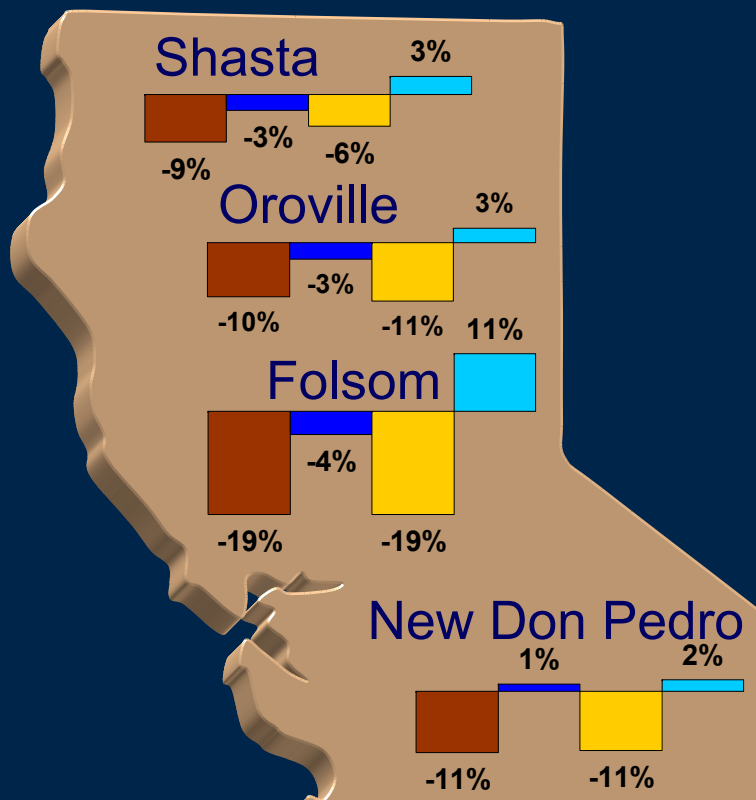
Conducted by Work Team

DWR Climate Change Report ~Jan06

- Potential Impacts of Climate Change
- Impacts of SWP and CVP
- Impacts on Delta Water Quality
- Implications for Flood Management and Water Supply Forecasting
- Impacts on Evapotranspiration
- Future Directions .

Sample Impacts Assessment

2050 Change in Reservoir Inflows



- GFDL – A2
- PCM – A2
- GFDL – B1
- PCM – B1

Knowing Impacts is helpful, but…

What are their probabilities?

Risk=Probability*Outcome